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(54) Cylinder head of an air-cooled fuel injection engine

(57) The area of the bridge 5 between the intake and exhaust valves (9, 10, Figure 2) containing the injector 8 is separated from the surrounding area of the head base 3 by expansion gaps (6, 7) having inserts which extend upwardly from the base towards the side walls of the head. The axis of the cylinder intersects a triangle whose apexes are defined by points of intersection of the axes of the valves and the injector with the base plane.

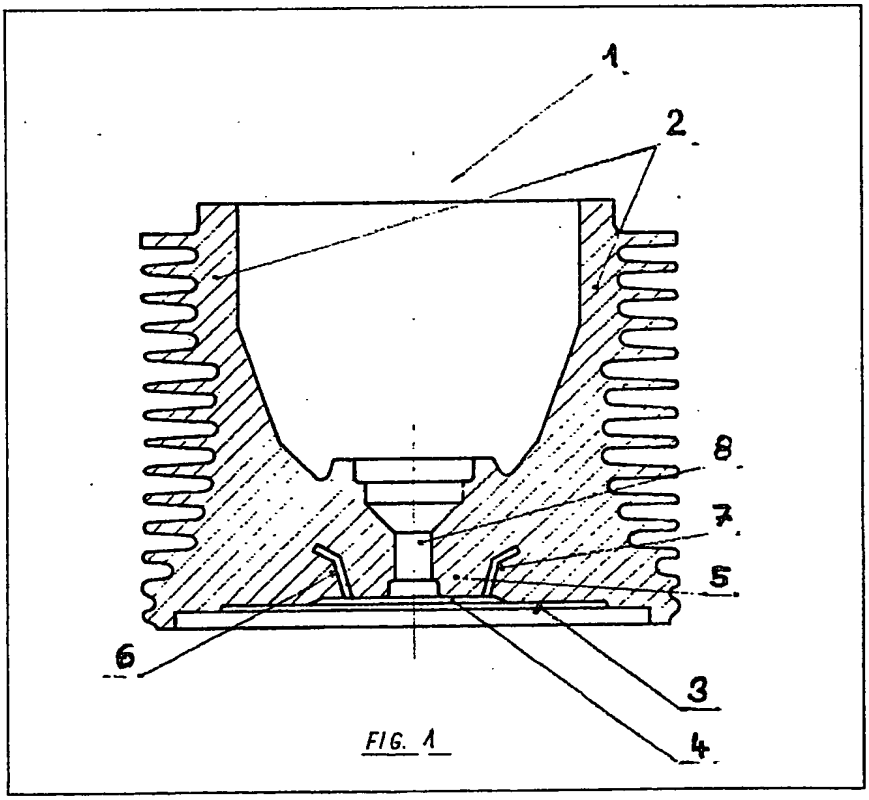

FIG. 1

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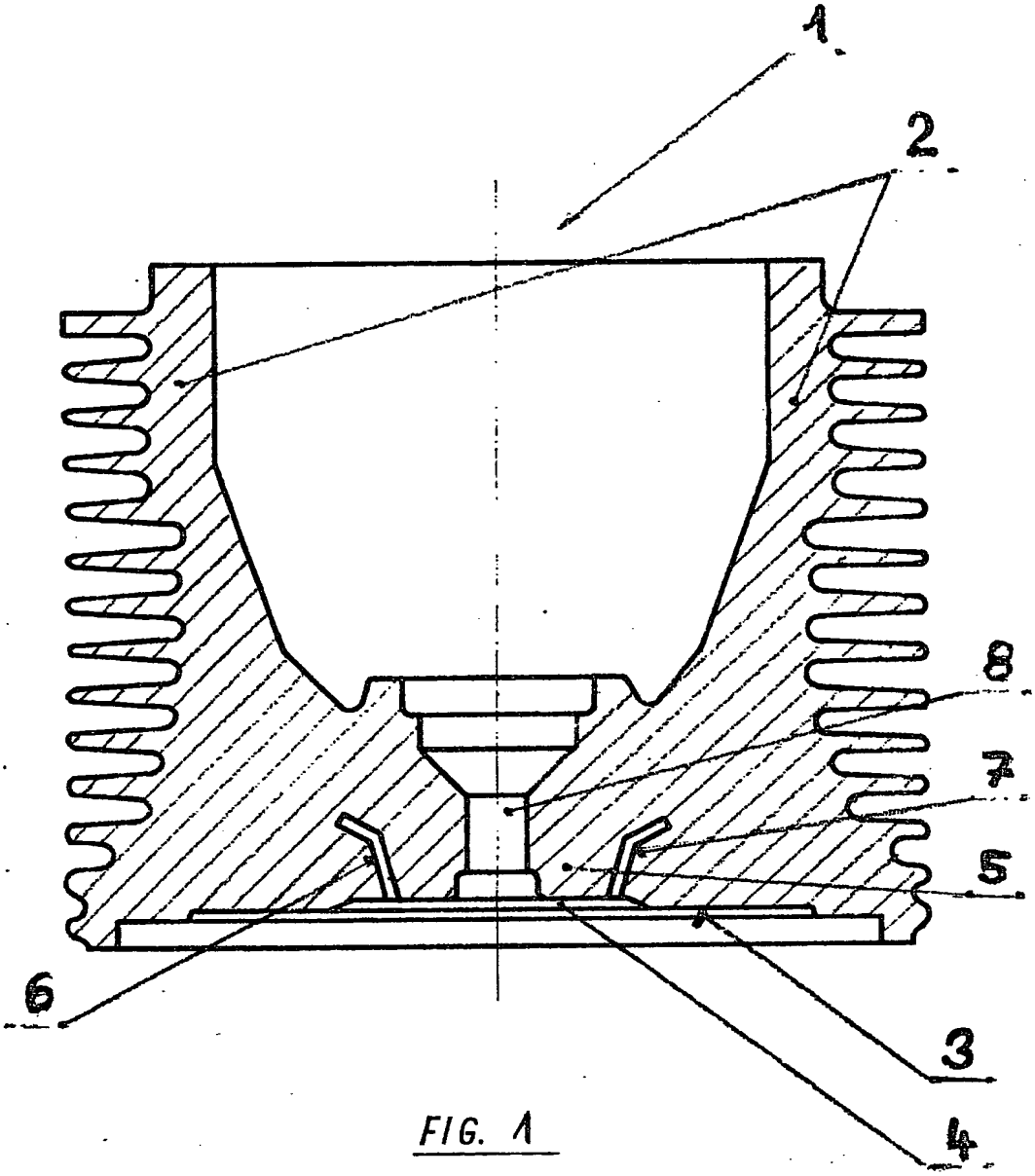

FIG. 1

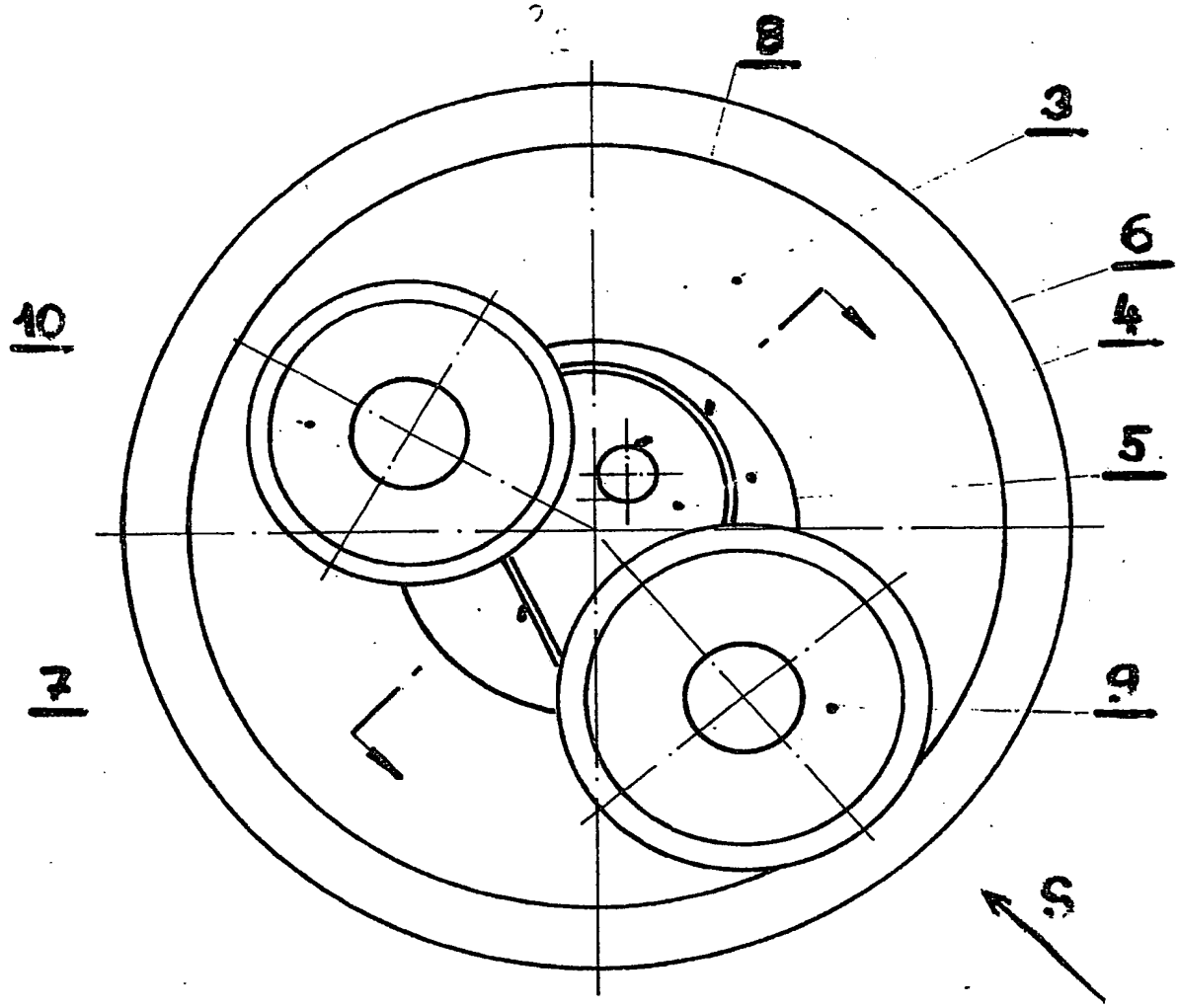

FIG. 2

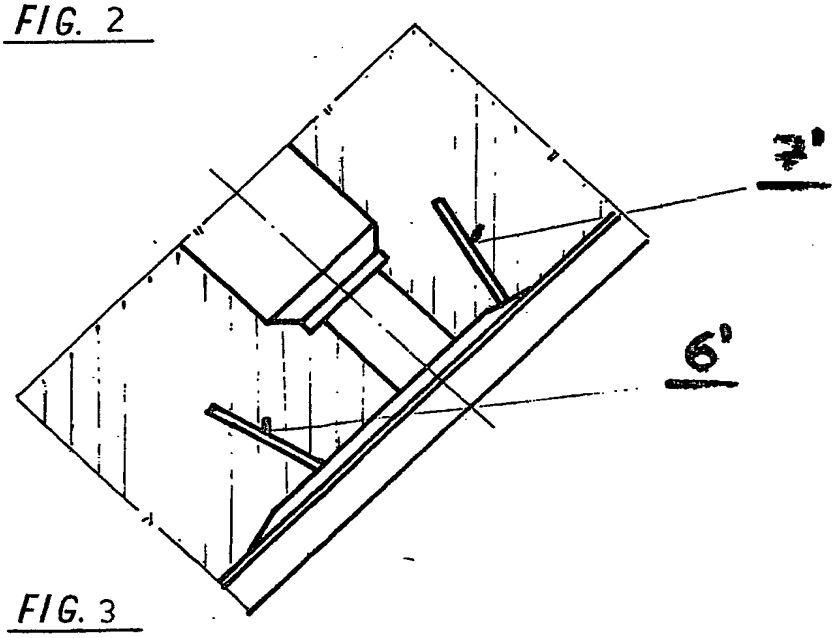

FIG. 3

SPECIFICATION

Cylinder head of an air-cooled spark-ignition engine

The invention relates to a cylinder head of an air-cooled spark-ignition engine, provided with cooling ribs, an injector situated in the area of the bridge between valves, dilatation gaps and a combustion space, the most part of which is defined by the piston and cylinder.

In air-cooled spark-ignition engines, the major portion of the combustion space is conventionally defined by the piston and cylinder and only a relatively small portion is provided by recessing in the base of the head. This is caused by requirements for an advantageous combustion, including turbulence of filling with respect to an optimum displacement of streams of injected fuel. The injector is conventionally arranged either in the axis of the combustion space, or has its axis deviated, but it lies in the area of the bridge between valves.

For the mentioned basic arrangement it is difficult to create a cylinder head for which heat dissipation from the central area is secured, especially from the area of the bridge between valves where the injector is also situated. Moreover, a high thermal loading of this area causes a mechanical stress, which changes its sense with the changing engine load. As it repeats when the engine is running, there appear cracks in the area of the said bridge when the limits of material fatigue are exceeded.

There are known cylinder heads of a pan type, consisting of a lower plate and of walls rising up from it and provided with cooling ribs. To improve heat dissipation from the area of the bridge between valves, the head walls become narrower towards the top, and the lower plate is thinnest in the area of the bridge and becomes thicker radially towards the circumference.

To increase heat dissipation from the area of the bridge between valves, the injector is shifted from the narrowest spot between the holes for the valves. These holes may be offset with respect to the cylinder axis in the opposite sense to that in which the injector is shifted, for the said effect to increase.

To decrease the above mentioned mechanical stress of the cylinder head base, there are known embodiments when in the base of the cylinder head there are carried out, besides holes for valves, dilatation gaps, which are filled with sheet inserts sealed in the base of the head. The dilatation gaps are perpendicular the base, from which they rise. To obviate peaks of stress arising at their end inside the head, they are ended with a slightly curved bend orientated in a plane perpendicular to the cylinder axis. This solution has a drawback, namely that the said ending of the dilatation gaps acts as a heat protection and it prevents heat from the bridge from being able to dissipate. This drawback is evident especially with heads of the pan type, where cooling is secured especially by ribs arranged on their outside walls. A drawback of the menti ned shapes of dilatation gaps also resid s in the accumulation of impurities in liquid metal near dilatation gaps at casting and in this way the quality of material is decreased. This is due to a disadvantage us fl w f metal in the area of the said ending of dilatation gaps.

The invention aims to secure sufficient cooling, depending upon heat dissipation from the most loaded spots, for a cylinder head of an air-cooled spark-ignition engine provided with cooling ribs, an injector situated in the area of the bridge between valves, dilatation gaps and a combustion space, the most part of which is defined by the piston and cylinder, and to prevent cracks from being created in these spots because of changes of sense of mechanical stress depending upon heat loading and because of changes of engine load. Another aim is to prevent impurities from accumulating near the dilatation gaps during casting of the head.

Accordingly, the invention provides a cylinder head of an air-cooled spark-ignition engine provided with cooling ribs, an injector situated in the area of the bridge between valves, dilatation gaps, and a combustion space, the most part of which is defined by the piston and cylinder, the head being of a pan-type with cooling ribs arranged most outside on walls of the head, the area of the bridge with the injector being separated from the surrounding area of the base of the head by the dilatation gaps which extend upwardly from the base towards the walls of the head and make, in a cross section of the bridge an acute angle with the plane of the base, the axis of the cylinder intersecting a triangle whose apexes ar defined by the points of intersection of the axes of the valves and the injector with the plane of the base, the distance of the dilatation gaps from the injector increasing in the cross section of the bridge in the direction upwards limited by distance gaps, preferably increases towards a suction valve. The dilatation gaps preferably have a variable distance in the base plane from the axis of the part of the rotation combustion space, which is carried out in the base of the head. At least one dilatation gap is preferably of a V-shape in a cross section, the lower part making with the base plane an angle of more than 60° and the upper part making an angle in the range 30° up to 60°. The triangle, formed by the points of intersection of the axes of the valves and the injector with the plane of the head base, is preferably directed by the apex defined by the point of intersection of the axis of the suction valve with the plane of the head base, against the direction of cooling air flow, and by the apex defined by the point of intersection of the axis of the injector with the plane of the head base, it is preferably laid in the projection into the plane being perpendicular to the direction of the cooling air flow nearest to the head walls.

In order that the invention may be clearly understood and readily carried into effect, a preferred embodiment thereof is, by way of example, hereinafter more fully described and illustrated in the accompanying drawings, in which:

Figure 1 shows a cross section of a cylinder head,

Figure 2 shows a view on the bottom of the head, and

Figure 3 shows variation of the dilatation gaps in the base of the head.

A cylinder head 1 is of a pan-type with walls 2

extending upwardly from the lower plate and being provided on outer sides with cooling ribs. In the base 3 of the head 1 is created a part 4 of a rotation combustion space, the bigger part of the combustion space not being shown. In the area of the bridge 5 between the suction valve 9 and exhaust valve 10, there is situated an injector 8. The area of the bridge 5 is separated from the surrounding area of the bottom 3 of the head 1 by means of dilatation gaps 6, 7, the shape of which in the cross-section is a V-shape. The dilatation gaps 6, 7 rise from the bottom 3 of the head 1 and they are filled with casted-in sheet inserts.

To meet requirements as to heat dissipation from the area of the bridge 5 between valves 9, 10 into the walls 2 of the head 1 of the cylinder, the dilatation gaps 6, 7 make an acute angle with the plane of the base 3 of the cylinder head 1, so that the increasing distance between dilatation gaps 6, 7 and the injector 8 in the direction from the base 3 may be secured. Angles between dilatation gaps 6, 7 and the plane of the base 3 of the head 1 meet simultaneously the requirement to prevent the appearance of cracks in their end sections.

To improve heat dissipation from the bridge 5, the valves 9, 10 are offset with respect to the cylinder axis in such a way that they make free the central area of the head 1. The injector 8 is then situated in the area of the bridge 5 between the valves 9, 10 so that the cylinder axis crosses a triangle whose apexes are defined by the points of intersection of the axes of the valves 9, 10 and the injector 8 with the plane of the base 3 of the head 1.

If the cooling air flows in the direction S, the said triangle is orientated by its apex defined by the points of intersection of the axis of the suction valve 9 with the plane of the base 3 against the direction S of the cooling air flow, and the apex defined by the point of intersection of the axis of the injector 8 with the plane of the base 3 lies in the projection into the plane perpendicular to the direction S of the cooling air flow nearest to walls 2 of the head 1. The cross section of the bridge 5, limited by dilatation gaps 6, 7 increases towards the suction valve 9. These arrangements also improve the heat dissipation from the parts of the head 1 which are most loaded by heat.

For technological reasons, when machining the part 4 of the circular combustion space, dilatation gaps have a variable distance from the axis of the combustion space. According to Figure 2, one dilatation gap 7 has a direct line course and the other dilation gap 6 has a circular course, in the view to the base 3 of the head 1. A centre of this circular bend lies outside the axis of the part 4 of the circular combustion space.

Figure 1 and 3 show two embodiments of dilatation gaps 6, 7 and 6', 7'. Dilatation gaps 6', 7' have in cross section a direct line course and dilatation gaps 6, 7 are cranked in cross section. To meet the above mentioned requirements there are most suitable, for the respective type of head, angles between dilatation gaps 6', 7' and the plane of the base 3 of the head 1 of more than 60°, for dilatation gaps 6, 7 it is not valid for their lower part, their upper part makes with the plane of the base 3 of the head 1 an angle in the range 30° up to 60°.

Although the invention is illustrated and described with reference to two preferred embodiments thereof, it is to be expressly understood that it is in no way limited to the disclosure of such preferred embodiments, but it is capable of numerous modifications within the scope of the appendend claims.

CLAIMS

1. A cylinder head of an air-cooled spark-ignition engine provided with cooling ribs, an injector situated in the area of the bridge between valves, dilatation gaps, and a combustion space, the most most of which is defined by the piston and cylinder, the head being of a pan-type with cooling ribs arranged mostly outside on walls of the head, the area of the bridge with the injector being separated from the surrounding area of the base of the head by the dilatation gaps, which extend upwardly from the base towards the walls of the head and make, in a cross section of the bridge, an acute angle with the plane of the base, the axis of the cylinder intersecting a triangle whose apexes are defined by the points of intersection of the axes of the valves and the injector with the plane of the base, the distance of the dilatation gaps from the injector increasing in the cross section of the bridge in the direction upwards from the base.

2. A cylinder head as claimed in Claim 1, wherein the cross section of the bridge defined by the dilatation gaps increases towards a suction valve.

3. A cylinder head as claimed in Claim 1 or Claim 2, wherein the dilatation gaps have a variable distance in the base plane from the axis of the combustion space, the combustion space being circular in the base of the head.

4. A cylinder head as claimed in any preceding claim, wherein at least one dilatation gap is of a V-shape in a cross section, the lower part making with the base plane an angle of more than 60° and the upper part making an angle of between 30° and 60°.

5. A cylinder head as claimed in Claim 1, wherein the triangle formed by the points of intersection of the axes of the valves and the injector with the plane of the base of the head is directed by the apex which is formed by the point of intersection of the axis of the suction valve with the plane of the base of the head against the direction of cooling air flow, and by the apex which is formed by the point of intersection of the axis of the injector with the plane of the base of the head, it is laid in the projection into a plane lying perpendicular to the direction of the cooling air flow nearest to the head walls.

6. A cylinder head substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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